THE DENTAL PRACTITIONER
AND DENTAL RECORD

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THE DENTAL PRACTITIONER AND DENTAL RECORD

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EDITORIAL

THE DENTIST AND HIS YOUNGEST PATIENTS

THE surgery door opens. The sound of protesting, fearful cries is heard. And then a small procession enters: a child of perhaps six years old, white-faced and terrified, being urged on by its mother with such encouraging remarks as "It won't hurt, darling"... "Now, dear, be brave"—followed by the resigned but saddened figure of the dentist's receptionist, who has been witness to the same performance all too often before.

Medieval torture? No. The first visit of a child to the dentist.

Disgraceful? Yes. And entirely unnecessary.

Far too frequently a child's first visit to a dentist is made when some unpleasant emergency must be performed: the removal of a tooth, the alleviation of pain caused by gross caries, or the treatment of a fractured incisor. We have all suffered from the mental distress inflicted on the youthful mind as a result of this treatment—and its heralding by the parent.

And yet how simple is the prevention of such distress. It lies in the hands of both the dentist and the parent. Their mutual co-operation is vital; and it is the dentist who should inaugurate such a liaison.

It is his responsibility to explain to the parents the need for early and continued examination of their children's teeth. This should start long before any treatment is anticipated. Probably the most satisfactory approach is for the child to attend the dentist at the same time that the parent keeps an appointment for routine examination. The child is allowed in the surgery, and merely watches for the first two or three visits before being invited to sit in the chair himself. In this way confidence is built up to pave the way for simple oral prophylaxis. It is absolutely essential that the dentist, as well as the doctor, should be presented to a child as a friend and counsellor and not as a white-coated bogy man standing in a lair of sinister instruments and Sweeney Todd-like chair.

Once confidence has been established, the more serious business of removing caries and extractions should not prove too upsetting to the child. The administration of local anæsthetics is not as difficult a procedure as one might expect; especially if instruments are not too freely brandished before the small patient. Every phase of treatment should be explained in simple terms, and the child should be allowed to watch, when possible, through a mirror. Children are, for the most part, strongly responsive to reason but equally strongly suspicious of evasions and, worst of all, *silence*.

It is the dentist's responsibility to brief parents on their approach to their children. The choice of words in referring to dental treatment before a child must be considered carefully. "Extraction", "gas", "needle", "drill" all have unpleasant connotations and should be avoided. Parents frequently remark that treatment "will not hurt" and by the very use of the negative imply the positive. If anyone is to discuss discomfort it should be

the dentist. At all costs, the faith of the child in its parents and in the dentist must be preserved. For once, through albeit well-meant deceit, this faith is destroyed, all is lost.

And how tragic that the young patient's attitude to dental treatment may be impaired for a lifetime for want of a little psychology on the part of parents and our profession.

LABORATORY FACTORS AFFECTING THE FIT OF GOLD INLAYS

By **ROBERT W. WILLIAMS**

Instructor in Dental Technical Methods, University of Birmingham

THE word "good", as with most descriptions, has a relative meaning. When one uses the word to describe the fit of a gold inlay, accuracy to within $\pm 0{\cdot}2$ per cent (Herbert and Thompson, 1934) is normally accepted as being clinically satisfactory. This is achieved by balancing the shrinkage factors with the compensation factors.

The vast volume of literature devoted to the subject demonstrates the confusion which exists satisfying this requirement of "fit".

The engineer is more specific in his measurements because his practical work can be inspected by micrometer or optical instruments. In the dental field, however, the conclusions are for the most part empirical.

For some years there has been a demand for more compensation on the assumption that gold alloys shrink more than was previously thought. This trend is, in the opinion of the writer, a wrong one, for the reasons to be discussed later.

FACTORS AFFECTING FIT

1. Shrinkage.—

a. Shrinkage of Wax Pattern from Mouth to Room Temperature.—A wax pattern when formed directly in a tooth cavity at mouth temperature will, upon removal and exposure to room temperature, begin to shrink immediately. During the period of the large-scale investigations at the American Bureau of Standards about 1930, it was found that the average shrinkage of a number of different inlay waxes was 0·7 per cent with a drop in temperature of 17° C. It is likely that with waxes used in the earlier part of this century the figure would have been somewhat greater. Due to improved manufacture the recognized shrinkage of present-day inlay waxes is 0·4 per cent for this range of temperature.

b. Indirect Impression Shrinkage.—The commonest type of impression has been the copper ring and composition, either green or brown stick. The average figure of shrinkage for composition during the American Bureau of Standards (as paragraph **1**, *a*) investigation was 0·45 per cent. Present-day composition may show a shrinkage of 0·3 per cent, although some are claimed by the manufacturers not to shrink at all. Elastic materials such as hydrocolloids or rubber or silicone base may either shrink a little or exhibit some strain release.

c. Model Die Shrinkage.—When using a model cement or resin for the production of a die some shrinkage can be expected as a result of the setting reaction, and although no figures for these materials are shown, and although the shrinkage may be very small, some allowance should be made for this.

The overall picture suggests that both high-grade composition when copper-formed, or elastic materials when cast in a hard stone of known low expansion, show a high standard of stability in die reproduction.

d. Shrinkage of Wax in Indirect Methods.—When producing inlays with the indirect method, the wax pattern is formed to the die at room temperature, which means that the wax does not shrink when formed in the manner that it does with the direct wax pattern. There is, however, the danger that contraction will be uneven when molten wax is added to correct deficiencies in the partly completed wax pattern. Unless steady pressure is maintained while the wax is still soft

when forming wax to the die, gross shrinkage takes place away from the margins. This is common, for instance, at the floor of the boxes of M.O.D. preparations, and poor compensation has often been blamed when, in fact, the wax pattern was faulty.

The possibility of this error may be reduced by trimming the die carefully so as to expose fully the gingival edges.

e. Shrinkage of Gold in the Mould.—The shrinkage of gold alloys during cooling in cast inlays as determined by Coleman (1926) was 1·25 per cent $\pm$ 0·01 per cent. It would be expected from the physical constants of gold alloys that the shrinkage would be 1·6 per cent or more, and because these figures are often quoted instead of the figure 1·25 per cent, some explanation is pertinent.

During investigations by Coleman and others there have been varied findings, and it was not until Coleman related his pattern of mould to that which might be similar in bulk to inlay castings that he found consistency in his resulting figures. It appears that the molten metal entering the inlay mould starts to solidify at the walls of the mould because the mould temperature is much lower than that of the gold. The supposition is that this initial layer tends to adhere to the mould surface. By the time the casting is sufficiently strong to contract independently of the mould surface some of the shrinkage has already occurred, helped by the continued supply of molten metal from a correctly sprued reservoir. The gold-shrinkage factor is an anomaly and an example of a recognized coefficient figure not being applicable in practice.

To the present time, although still questioned, the work of Coleman has not been disproved or in any way improved upon and his figures will therefore be regarded as the most acceptable,

2. Compensation.—

a. Expansion of Wax Pattern.—Expansion of the wax pattern would seem to be a logical approach for overcoming the shrinkage factor, for, in theory, by raising the temperature of a water-bath into which a freshly invested wax pattern has been placed to any known degree, the pattern could be returned to, or even expanded above, its original size. The method is attributed to Van Horn (1910). After investing the wax pattern, both ends of the inlay ring are immediately sealed and the whole submerged into a tank of water at a constant known temperature. The pattern expands before initial set of the investment is reached.

b. Expanding Die Material.—As with wax expansion a die expansion would seem to be a logical approach for overcoming the shrinkage of an impression material.

Model amalgams usually expand a little and might have accounted for the high average figure of 0·3 per cent arrived at during the American Bureau of Standards (as paragraph **1,** *a*) investigations previously mentioned. In Great Britain model amalgams are now little used. The following materials are common: deposited copper showing an accurate reproduction, model cement with some expected shrinkage, and stone plaster with a varying expansion figure of 0·15 per cent upwards.

c. Set Expansion of the Investment.—This is the result of normal setting reaction of the gypsum products contained in all investments which come within the province of this article. Gypsum in the form of plaster or hydrocal is incorporated in the investment in amounts varying from 20 per cent to 40 per cent. The expansion figures claimed by manufacturers (provided that the proper water–powder ratio is observed) may range from a little under 0·2 per cent to as much as 0·9 per cent. Both ordinary set expansion and "continued" set expansion, which is normally termed "hygroscopic", can be determined accurately when in the form of linear test specimens. Whether an investment can expand fully and unrestrictedly in the area surrounding an irregularly shaped wax pattern is doubtful.

A slight rise in temperature takes place during the crystallization of the investment due to heat of setting reaction, but it is not sufficient to soften or expand the wax pattern to a degree where it is proportional to the full setting expansion. Expansion over and above the set expansion is inevitable in an investment when the casting ring is lined with wet asbestos due to the hygroscopic phenomenon.

A proportion of the set and hygroscopic expansion would presumably be restricted in the area of the pattern unless the wax were softened as in the wax-expansion method above.

d. Hygroscopic Expansion of the Investment.—Hygroscopic expansion was first made known in the dental field by Scheu (1932) and while not completely understood it is regarded as a phenomenon of continued set expansion. Since the introduction by Hollenback (1943) of his technique making use of hygroscopy, much has been written upon this factor. Mention should be made of two particular investigations: Lyon, Dickson, and Schoonover (1953) carried out their work in an attempt to explain the phenomenon which is given as: "It is assumed that the crystallization is not uniform during the setting reaction. Presumably, the greatest concentration of crystal growth will be in the vicinity of the hemi-hydrate particles. The crystals grow so rapidly in these areas that water becomes entrapped and cannot reach the hemi-hydrate particles to produce further solution. In time, of course, such entrapped water will diffuse through the mass. By that time, however, the crystallization will have proceeded to the point that the mass is rigid, and the growth of any crystals resulting from further hydration will be so inhibited that no observable increase in expansion will be evident.

"If the investment mix is immersed in water, the additional water upon reaching the unreacted hemi-hydrate particles will result in further hydration. The usual setting reaction can then continue uninterrupted, and more crystals of the dihydrate will be formed. Since the mass is still in a semisolid state, an expansion can continue to occur as a result of the outward thrust of the crystals."

Docking (1948) carried out excellent work in an attempt to evaluate the amount of expansion which might be obtained from a number of different brands of investment, covering the stages from the completion of mix to a period of initial set and up to 60 minutes. Apart from those instances of an investment of known and constant expansion figures, the results of such investigations by Docking are not of practical application because they are so variable, showing expansion up to 5 per cent. As explained under "set expansion", unless the wax pattern is expanded with the investment, it is doubtful whether the larger amounts expected are, in fact, achieved.

The Hollenback technique is regarded as a classic example of a hygroscopic method. The object of this technique is to cast into moulds which have only been fired to 450° C. He explains the method for compensation as "hybrid", involving wax, hygroscopic, and thermal expansion.

e. Thermal Expansion of the Investment.—Thermal expansion is the normal result when an investment is heated. The figures obtained

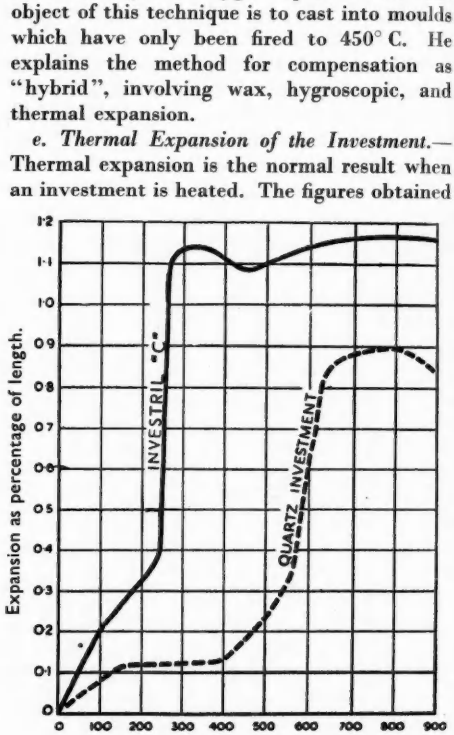

Fig. 1.—Comparative physical properties of quartz and Investril "C" investment materials. (*Reproduced by kind permission of W. J. Hooker, Ltd.*)

are not proportional to the rise in temperature and depend upon the choice of silica and the previous manufacturing process. The types of silica commonly used are quartz and/or cristobalite with a percentage of a gypsum product. The accompanying graph (*Fig.* 1) is some guide to the great difference in behaviour of these two. In dental investments the thermal

expansion figures may vary from 0·7 per cent to 1·4 per cent. One outstanding feature is that cristobalite shows no increased expansion in the temperature range 300° C. to 700° C. (*see Fig.* 1). This means that a small fall in temperature while casting will not cause an appreciable reduction in size of the mould, which allows a cooler mould to be used with resultant advantages outlined below.

f. Reducing Temperature of the Mould.—The method of casting into a "cooled" or "cold" mould is quite an old one, still practised extensively in industry, and normally termed "chill casting". It was common dental practice in the first quarter of this century, but fell into disuse possibly due to the discovery that the quartz investments showed an effective thermal expansion at high temperatures only (*see Fig.* 1). Although cristobalite became common early in the 1930's it was not the means of reviving "chill casting". Any credit for this must go to Hollenback with the introduction of his method. The object of firing his moulds to 450° C. and casting immediately was to obtain smoother castings which he, as others, found difficult when using hot moulds of 700° C. or over. Paffenbarger and Sweeney (1931) showed cristobalite to be ideal for casting at lower temperatures, but the practice still remains little known in Great Britain. The popular, though erroneous, feeling is that casting at higher temperatures is more certain.

The advantages of casting at lower temperatures (within the range of 350° C. and 500° C.) is to produce castings with smoother surfaces, more refined grain structure, and a reduction in the contraction of the alloy used.

Due to the development of high-grade gypsum and cristobalite products it is possible to fire this type of investment to a temperature of 700° C. At this temperature the carbon residue from the wax pattern is completely eliminated, and sufficient porosity is obtained to allow the gases in the chamber to escape during the entry of the molten gold. The mould will show no signs of cracking when allowed to cool from 700° C. down to 300° C.

Table I shows a possible, though simplified, example of the method of balancing the shrinkage factors with the compensation factors described.

Although it must be agreed that the tolerance of inaccuracy should be the low figure of 0·2 per cent mentioned earlier, there is ample

Table I.—SIMPLIFIED EXAMPLE

Direct wax pattern and indirect impression shrinkage factors averaged to 0·2 per cent

— per cent	ZERO	+ per cent	
Wax or impression	0·2	0·28	Effective set and hygroscopic from wet asbestos
Gold	1·25	1·17	Thermal from investment
	1·45	1·45	

evidence that satisfactory clinical results are obtained with higher tolerance figures as shown by McLean (1958).

3. Distortion of Wax Pattern after Removal from Mouth or Die.—

Memory of Wax.—Wax, in common with other plastic materials, is subject to induced strain during manipulation and moulding. As indicated by Skinner (1954), the amount of distortion, due to the release of strains, can be considerable over a period of time.

A rise in temperature will accelerate the speed with which the strain will release itself in a pattern, a reduction in temperature diminishes the speed of strain release (Skinner). This evidence might account for much of the failure of the "wax expansion method".

It would seem that the acceptance of the factor **1**, *a*, avoidance of any further rise in the temperature of the wax pattern, and observance of the rule to invest wax patterns as soon as possible after removal from the cavity or die will negate any further concern.

It should be noted that some hygroscopic methods involve placing freshly invested wax patterns in a water-bath at 38° C. or even higher temperatures. Such methods would more precisely be termed "wax expansion and hygroscopic".

4. Poor and Rough Surface Reproduction in Casting.—

a. Eminences and Nodules on Cast Surfaces.—These are caused by air trapped in the investment mix or water films left on the surface of the wax pattern (Skinner, 1954). The

use of surface tension reducing solutions is one of the ways to overcome this troublesome factor, but the most effective method is to invest under a high vacuum (Ireland, 1949).

b. Over-rapid Heating or Overheating of the Mould.—Over-rapid heating of a mould will cause minor explosions in the mould and result in cracking and the loss by breakage of fine edges of investment. These faults will be manifested on the casting as "finning" and rounded, instead of sharp-angled, crevices.

Gross overheating has the effect of weakening the gypsum binder in the investment, and can account for the loss of sharpness and rough surfaces upon the resulting casting.

c. Insufficient Burn-out of Wax.—During the drying period the inlay ring is placed sprue hole downwards so that the greatest amount of the wax pattern will melt out of the mould. With further heating carbon will form on the inside walls of the mould, and unless this carbon deposit is completely removed the pores of the investment are blocked, thus preventing the gas in the mould escaping during the entry of the gold.

It is further suggested that carbon in the mould combines with available oxygen to form carbon monoxide gas. Usually when this occurs the gas creates back pressure to cause rounded margins and loss of definition (*Ney Gold Handbook*). This fault is manifested by the bright yellow appearance of the gold casting.

5. Shape of Pattern.—The work carried out by Phillips (1937) investigating the variation in the amount of compensation required for different shapes and sizes of inlay patterns was unique. In the writer's opinion, his results and recommendations are of the most practical value. His method, known as Custom Built inlays, is used with the high thermal expanding Kerr cristobalite inlay investment; the compensation figures are given as 0·36 per cent set and 1·25 per cent thermal. The combined figure of 1·61 per cent is his maximum and to obtain the varying lowered figures of compensation increased amounts of control powder are added. No information is available upon the control powder and it may be presumed to be another form of "silica" with a lower thermal expansion (*Table II*). A graduated balance is used in the method, and the balance is set to proportion the control powder and cristobalite according to different shapes and sizes of patterns, room temperatures, and the purpose for which the inlay is to be used.

The soundness of Phillips's research is that although theoretically expansions and shrinkages should hold good under any circumstances, in practice these will vary with irregularity of shape and bulk of inlay casting.

Table II.—EXPANSION VARIATIONS ORDINARILY REQUIRED FOR VARIOUS PREPARATIONS

EXPANSION REQUIREMENTS	PATTERN TYPE	AUTOMATIC SCALE GRADUATIONS EMPLOYED
Average	Bicuspid M.O.D., and	At existing room temperature
	Small molar M.O.D.	At existing room temperature
Less than average	Large molar two-surface (M.O., etc.)	Room temperature + 10°
	All medium size two-surface	Room temperature + 15°
	All small two-surface	Room temperature + 20°
	Bicuspid three-quarter crowns	Room temperature + 10°
	Anterior three-quarter crowns	Room temperature + 15°
More than average	Molar three-surface (M.O.D., etc.)	Room temperature — 5°
	Full molar crowns	Room temperature — 10°
	All one-surface	Room temperature — 10°
	Metal dies (M.O.D. and full crown)	Room temperature — 10°

Add ten degrees to the figure determined above for weighing if the casting is to be employed as a bridge retainer, to increase retentivity. (*Reproduced from Phillips*, 1937.)

DISCUSSION

In the foregoing discussion it is not intended to suggest that the casting of accurately fitting inlays is beyond the reach of most, but rather to put into perspective the factors which matter. Accounts from existing methods are secondary to the factors contained in this article, and further information upon any particular method may be obtained by following the references.

Mention may be made of possible restriction to thermal expansion caused by the inlay ring. Split rings are commonly used to overcome this. Jorgensen (1958) advocates the use of a paper ring to obtain proper expansion, but the writer is of the opinion that the protection given by a ring to a small mould must be considered.

Any claims by manufacturers for set expansion, hygroscopic expansion (when known and constant), and thermal expansion are normally accurate if instructions are carefully followed.

If the use of wax expansion is included in the hygroscopic methods which are successful, then some second thoughts should be devoted to "wax expansion", for the use of another name does not alter physical behaviour.

The makers of Beauty Cast (U.S.A.) investment recommend investing without an asbestos liner or using one or two asbestos liners to obtain varying compensation with their investment.

Later research by Asgar, Mahler, and Peyton (1955) advocates a "water added" method to control the amount of hygroscopic expansion. In this they observe Phillips's work and obtain less than average, average, or more than average compensation by adding 0·9, 1·0, 1·1 c.c. of water to the freshly invested pattern mould with a syringe.

While it is usual to add the hygroscopic and thermal figures together and assume that the sum total holds good throughout the firing period, the writer would feel happier to have known that investigations had continued to the fired stage to verify that the larger hygroscopic figures were true.

CONCLUSIONS

1. Investment/water ratio is important and must be standardized.

2. Casting temperature is important. Reasonable variation in casting temperature must not affect the thermal expansion, i.e., expansion curve should be fairly flat at casting temperature range.

3. Shape of inlay affects the compensation required.

METHOD BASED UPON CONCLUSIONS

Direct and indirect patterns are invested immediately upon removal from the mouth or die.

A low set, high thermal expanding cristobalite investment is used (W. Hooker, London: Investril "C"). Proportions of powder and water are weighed and measured, using a simple set weight and measure for a standard size ring (12 c.c. water, 31 g. powder). Wet asbestos is used to line the ring, making provision for cushioning the setting investment. The asbestos liners are cut to standard size which allow for approximately $\frac{1}{4}$ in. of the ring at the sprue end to remain uncovered, and avoid the chance of the fired investment slipping from the ring.

The mix is hand spatulated in a stainless steel beaker (glass jars are regarded as unsafe with highly efficient units) for 30 seconds and vacuumed in a high vacuum produced by an Edwards motorized unit (Medivac) for 30 seconds (*Fig.* 2). The mix is then poured into the ring-and-rubber extension by vibration and again vacuumed under the stainless steel beaker on a vibrator for another 30 seconds (*Fig.* 3).

The ring used is copper (high expansion) so as not to restrict the thermal expansion of the investment.

The investment is allowed to set on the bench for at least one hour, as advised by the manufacturer, and then dried out upside down in an oven at approximately 250° C. for 30 minutes, during which period the sprue is removed and most wax is eliminated. Finally, it is placed in a furnace at a temperature of 700° C. for at least 20 minutes, to obtain sufficient porosity and complete removal of carbon. (This drying and firing method is necessary where large numbers of inlays are produced throughout the day.)

The ring is removed from the furnace and allowed to cool for $1\frac{1}{4}$ minutes; the gold is then melted, and the casting procedure carried out with a centrifugal casting machine. The cooling period may be extended to 2 or 3 minutes, but the time $1\frac{1}{4}$ plus approximately $\frac{3}{4}$ of a minute required to melt the gold properly will result in a drop in the mould temperature to approximately 500° C. The purpose of this is to obtain finer grain castings, more dense and free from surface roughness, as mentioned previously. The gold should be thoroughly melted and superheated to almost a white heat before casting.

Fig. 2.—Illustration shows Medivac pump (A) in background (normally enclosed with cover). It is connected to a Dental Manufacturing Co. base (B) designed by Dr. Ireland. Intermediate between pump and base is a trap (C) to avoid chance of investment being sucked into pump. The vibrator (D) is a Kerr-Croform pattern and when vacuuming mix alone, the base is inverted. When investing the wax pattern the procedure is the normal one of assembling all parts on the base and inverting the beaker over them.

Because the compensation figures claimed by the manufacturer for this British cristobalite investment are 0·19 per cent set and 1·17 per cent thermal, it might be termed average on the basis of Phillips's work. The writer overcomes any slight under-expansion of a large completely extra-coronal casting by using two asbestos liners or by etching away a little of the fit surface with aqua regia, thereby enlarging the casting. The outer surfaces and margins are insulated with wax, ensuring that only the fit surface to within approximately 1 mm. of the margin is etched. Similarly, in the instance of a large M.O.D. casting where the intra-coronal block fits too well and the friction between axial surfaces prevents seating into the cavity, the etching will make this block smaller. In compound inlays (for example, a veneer crown combined with intra-coronal M.O.D. and lingual or buccal extensions), etching permits adjustments where desired in one operation. The need for this treatment arises only in a *small fraction* of the number of inlays or crowns produced by the method described.

Fig. 3.—Illustration shows detail of small parts common to all vacuuming methods. The rubber sprue base (A) is designed for a good seal with the casting ring and shaped as a truncated cone, making it suitable for use with all types of casting apparatus. The casting ring (B) is standard in size for the rubber base, and the extension rubber ring (C) is simply a length of hose pipe. The base (D) and tripod (E) are supplied by the Dental Manufacturing Co. (*see Fig.* 2). The stainless steel beaker (F), which substitutes for the usual glass bell jar and also acts as the mixing vessel, is obtainable from Phillip Harris, Birmingham.

SUMMARY

1. The factors which affect the fit of gold inlays have been discussed.

2. Most dimensional changes in wax patterns and impression materials, together with the shrinkage of gold alloys, are beyond the control of the operator. The method described to compensate for these factors is based upon the result of work by leading investigators in this field.

3. It is shown that many variables enter into "indirect" inlay reproduction and that every attempt should be made to balance as nearly as possible each factor and standardize each stage.

4. The use of a low set and high thermal expansion cristobalite allows for the "chill casting" method described and produces the desired accuracy of fit.

5. Technical methods which remain a series of simple stages are preferable unless improved or spectacular results are obtained in the many complicated procedures.

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The Surface of Cementum

One hundred and nine human teeth selected at random, but with the epithelial attachment on the cementum, were treated in different ways to remove the periodontal membrane and cementoid in order that the surface of the cementum might be noted.

It was found that digestion of the organic material with trypsin produced an undamaged cementum surface for examination. Ethylenediamine and mechanical methods produced artefacts.

The surface of unexposed cementum exhibited imbrication lines, isolated minute nodules, surfaces having an over-all nodular appearance, and dish-shaped areas. Hypercementosis manifested by irregular deposition occurred mainly in the apical area.—BENSON, L. A. (1959), *J. Periodont.*, **30**, 126.

Salivary *p*H Examination amongst Indian Children and its Relation to the Incidence of Periodontal Disease

A survey of 735 Indian school children between the ages of 11 and 16 years showed that there appeared to be a variation in the salivary *p*H between the lower and upper income groups, though no conclusive statistical proof was provided. The average mean salivary *p*H was $7{\cdot}53 \pm (2{\cdot}58 \times 0{\cdot}122)$.

No correlation between age and *p*H value was found, nor was there any relationship between the salivary *p*H and the incidence of generalized periodontal disease. A significantly higher incidence of generalized periodontal disease was found affecting the maxillary posterior segments than in the corresponding mandibular posterior segments, but no significant difference was found between the maxillary and mandibular segments.

When the mouth was not generally involved the anterior regions of both jaws were more or less equally involved, but the mandibular posterior segments were more frequently involved than the maxillary segments in approximate inverse ratio to those cases where there was generalized involvement.—SANJANA, M. K., MEHTA, M. K., SHROFF, B. C., and DOCTOR, F. S. (1959), *J. Periodont.*, **30**, 328.

DENTAL RADIOLOGY IN THE NATIONAL HEALTH SERVICE*

By **W. G. SENIOR**, C.B.E., F.D.S. R.C.S.

In terms of dental care the expression "National Health Service" embraces the Hospital and Consultant Service, the General Dental Service, and the Priority Services. The latter is for expectant and nursing mothers and pre-school children under local health authorities. The dental care of school children is the responsibility of the School Health Service under local education authorities. In all of these services facilities for X-ray examination exist. Dental care in the National Health Service covers the population of England and Wales, which in 1958 was estimated at 45 million persons. Of this number, 35 per cent were aged 20 years or less, about 53 per cent between 20 and 55 years. The reason the age distribution is mentioned at this point will become clear later when I endeavour to analyse the age distribution of X-ray examination in the General Dental Service.

There is no clear line of demarcation between any of the above dental services. Indeed, there is necessarily a good deal of interchange. Thus, the pre-school child may be treated on one occasion in a clinic of a local authority, on another in the surgery of a private dentist under General Dental Service arrangements, or it may be referred for treatment in the Hospital Service. On any one, or, indeed, all of these occasions it may be the subject of X-ray examination. This possibility applies, of course, to any person of any age. It will be appreciated, therefore, that to arrive at any estimate of the precise number of persons undergoing dental X-ray examination in the course of a single year, still more the number undergoing repeat examinations in subsequent years, and to deduce therefrom the total radiation dose-rate, is a matter of considerable difficulty. Nevertheless, it is understood that the statistical experts are likely to be able to arrive at some approximation. The Medical Research Council's report on the "Hazards to Man of Nuclear and Allied Radiations" estimated that in 1955 the total number of X-ray examinations carried out in the Hospital and other Services was nearly 18 million. In the Hospital Service, X-ray examination of teeth was estimated to represent about 0·5 per cent of that total, and X-ray examination in the General Dental Service 4·8 per cent.

In the General Dental Service, the Dental Estimates Board take a 2 per cent sample of all completed estimates authorized for payment. This is analysed by sex, age, and details of treatment involved. In 1958, X-ray examination figured in 990,000 estimates. This was an increase of 110,000, or 12·5 per cent on 1957. The estimated cost was about half a million pounds. The increasing use of X-ray examination in the General Dental Service is illustrated by a comparison of the 1958 figure—990,000 estimates—with the figure of 413,000 in 1953—more than double.

It is interesting to examine the categories of radiographic examination. The breakdown for 1958 is available both as to category and age. In 1958 there were, in round figures to the nearest thousand, 600,000 estimates for intra-oral radiographs, 8000 for extra-oral, 340,000 for bite-wings. The balance, of course, was made up of mixed bite-wing and intra- or extra-oral radiographs.

In the case of the intra-oral estimates, the age distribution is more or less what one would expect to find: 36 per cent of the estimates cover the age-group 0–20 years, 22 per cent the age-group 20–30 years, and 25 per cent the age-group 30–44 years. Seventeen per cent of estimates cover the whole of the age-group 45 and over. The pattern in bite-wing estimates is rather more striking. Thirty-nine per cent were for ages 0–20 years, 32 per cent 20–30 years, 24 per cent 30–44 years, leaving only 5 per cent in respect of ages 45 and over. This is in line with clinical expectations.

* Given to the British Society of Dental Radiology, December 10, 1959.

The age distribution of bite-wing estimates has a particular interest for the State, since we believe that the increase in the total number of estimates for X-ray examination is largely due to the increased use of bite-wings. The old teaching of mirror, probe, and floss silk was time-consuming, and in the hands of the most careful operator was uncertain. The bite-wing is quick, and if properly used it is certain. One wonders whether there is justification for what appears in some practices to be a frequent bite-wing check-up in children. Bearing in mind that while a practitioner's knowledge of a patient's susceptibility to caries may guide him in the frequency of radiographic examination, frequent radiography of children should be avoided.

One wonders what is the teaching in this respect and if there is uniformity in the teaching !

As in the General Medical Services there is machinery for investigating what is known as excessive prescribing, so, too, of recent years there has been introduced a similar machinery into our General Dental Service arrangements to check suspected cases of the provision of excessive treatment resulting in undue cost to the State. When it is found under this procedure that the percentage earnings of a particular dentist in respect of bite-wing examination of his patients is 6·14 compared with the average of 0·84 in the Region in which he practises, one is bound to look for an answer. It may be that other men in the Region are negligent in this respect, it may be that the particular man is cashing in on the Service or may appear to be doing so. The piece-rate system on which the dentist's remuneration is based might be thought to lend itself to abuse —indeed, in some instances this has proved to be the case. Where the attention is directed to such cases as have just been described, arrangements are made for a pastoral visit by a Regional Dental Officer and, of course, to ascertain what is the custom in the area where the man practises. It should be emphasized that the object is not to reduce necessary diagnostic X-ray examination, but to ensure that patients are not exposed to unnecessary radiation hazards and, of course, that the State is not put to unnecessary expense.

Another aspect of this problem, which is also a cause of much concern, is the unduly large proportion of radiographs, which prove to be of little diagnostic value, submitted in support of claims for payment. It may be the fault of the operator; it may be the fault of his machine. Again, one wonders if students of to-day are taught not only the technique of angulation and exposure but afforded a proper opportunity to learn and to understand dark-room technique.

Have we any means of ascertaining what is the degree of efficiency of the X-ray machine in use in the average dental practice in this country, or of the understanding of general practitioners of the necessary precautions they should take? On this point it must be said that the question of radiation hazards in relation to dental practice has been dealt with by several authors in recent times. The need for a proper understanding of precautions is not peculiar to the National Health Service. It is to be hoped that the minimum educational requirements of the General Dental Council in regard to the students' knowledge of dental radiology are interpreted to include a knowledge of the hazards and precautions. Similarly, one hopes that the training schemes for dental chairside assistants include such training.

It is perhaps unnecessary to refer to the close interest which the Ministry has undertaken in the question of radiation hazards. The appointment of the Committee under the Chairmanship of Lord Adrian is well known. It was natural that a dental panel should have been included among the expert panels set up to investigate various aspects under the purview of the main committee. The Dental Panel has, over a period of getting on for two years, been carrying out exceedingly interesting investigations which should enable the size of the dental problem to be answered much more clearly. We await the final result of their researches with considerable interest.

Looking to the future, it seems clear that just as it is now the exception to find a dental surgeon using a foot engine in his ordinary daily practice, so, too, in a few years it will be

the exception to find a dental practice without an X-ray machine. Provided this valuable diagnostic aid is not permitted to become the master one would say "roll on progress", but just as most men have in their attic available the old dental engine in case of an electricity cut, so one hopes the student and practitioner of the future will be taught to put clinical diagnosis first and regard X-ray technique as his necessary diagnostic aid.

FRACTURE OF ADAMS CRIBS

By **JOHN HEATH** (Sen.), *Melbourne*

ADAMS cribs, or clasps (*Fig.* 1), are made of 0·028 in. (0·7 mm.) high-tensile stainless steel wire.

These wires tend to fracture, and when repaired by soldering they lose their more desirable qualities. This fracture and repair

Fig. 1.

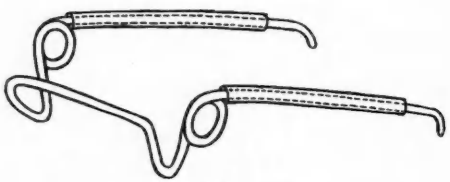

Fig. 3.

are particularly serious when children travel long distances, and when two to four months elapse between visits as is common practice when the Heath X Plate is used here.

In the Adams crib for an ordinary plate there is considerable length of wire from each arrow-head to where the wire enters the acrylic material. It is here that most fractures occur.

But in the X Plate much more of the wire is embedded in the plate. This is because the wires have to pass through the anchorage part of the X Plate, into which the lower side teeth bite to prevent the upper buccal segment moving mesially while labial segment teeth are being retracted.

This shortening of the free wire led to a high incidence of fractured wires, with loss of much time and efficiency with added costs. The free wire length has been increased by

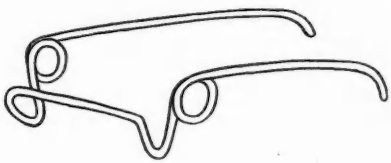

Fig. 2.

the inclusion of the two small loops illustrated (*Fig.* 2), which act as stress breakers.

Where the wire enters the plate at two points, they are drawn through, and covered by, lengths of size 18 stainless steel tubes (*Fig.* 3). These tubes are annealed in a flame. This softening allows them to spread a little at the points of wire entry, and fracture of wire there has been almost totally eliminated.

Speed of Wire Bending.—Skilled technicians tend to bend high tensile wires too fast. A fast-bent wire is much more liable to break than one bent slowly. These breakages cost much more than the cost of the time saved by rapid wire bending. This particularly applies to the more recent stainless steel wires of up to 140 tons tensile which help to make the Adams crib, modified as described above, as good as any wire clasp, and further enhance the value of the X Plate in its particular field of application.

THE SURGICAL TREATMENT OF THE INFRABONY POCKET*

By **J. D. SPOUGE**, M.D.S., F.D.S. R.C.S., M.R.C.S., L.R.C.P., L.M.S.S.A.

Lecturer and Research Assistant in Periodontology and Pathology, Royal Dental Hospital of London School of Dental Surgery, University of London

AN infrabony pocket is one in which the deepest part of the pathologically deepened crevice is apical to the level of the crest of the adjacent alveolus. The pocket is incompletely lined by a poorly developed epithelium which covers vascular granulation tissue (*Fig.* 1).

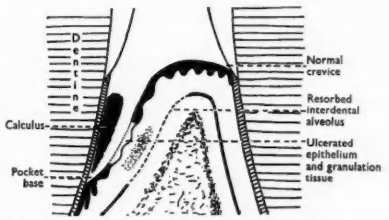

Fig. 1.—Schematic view of an interdental space associated with an infrabony pocket.

Aetiological factors include local irritation, abnormal occlusal stress, and parodontal abscesses draining via the gingival crevice (Wade, 1958).

THEORETICAL CONSIDERATIONS IN POCKET ELIMINATION

The methods available for infrabony pocket elimination may be divided into radical and conservative.

Radical methods remove one of the walls of the pocket—the outer wall by combined gingivectomy–osteo-ectomy; or the inner wall by tooth extraction.

Conservative methods endeavour to obtain re-attachment of the periodontal membrane by a process equivalent to healing by first intention. They correct the conditions contributing towards pocket formation, and then perform a limited local removal of the affected tissues. Clinically, conservative methods divide themselves into "Closed Methods" where access is obtained via the pocket, and "Open Methods" where a flap is raised and pathological tissues removed under direct vision. Either method may incorporate bone-grafting.

Histologically, re-attachment involves the differentiation of cementoblasts, osteoblasts, and fibroblasts, and the laying down of cementum and bone to incorporate the collagen fibres of the new periodontal membrane. Cementoblasts closely resemble osteoblasts, and are probably a related cell with an increased degree of specialization. Hence, the well-known conditions essential for bony regeneration should probably also be regarded as the minimum ones necessary for cementum to regenerate. These conditions include a sterile blood-clot uniting the hard tissues, and sufficient immobility to prevent rupture of delicate capillaries during organization.

SPECIAL FACTORS IN DIAGNOSIS

Accurate diagnosis requires radiographic definition of the soft-tissue base of the pocket by the use of Hirschfeld points, G.P. points, or injection of radio-opaque material. To compare this accurately with the level of the adjacent hard tissues necessitates sufficient under-exposure of the film to permit visualization of soft-tissue outlines (Prichard, 1957), thereby ensuring that all partially resorbed bony trabeculæ may be seen.

DESCRIPTION OF THE CLINICAL PROCEDURES

Radical Methods.—

Combined Gingivectomy–Osteo-ectomy.—This method is permissible where the tooth is firm and the bone involved is not helping to support the adjacent tooth. Minimum support is derived from bone on the outside of a pocket, and therefore the stability of the tooth should not be impaired by removal of this bone.

* Given at the meeting of the British Society of Periodontology held on January 11, 1960.

If the amount of bone to be removed is large, a full flap may have to be raised. Usually, however, a modified flap is sufficient. Schluger (1949) extended Kirkland's original approach to permit removal and re-shaping of the bone, after which the flap was replaced, recontoured, and covered with a surgical pack.

In certain cases revolving diamond stones may be used to re-shape the bone, working

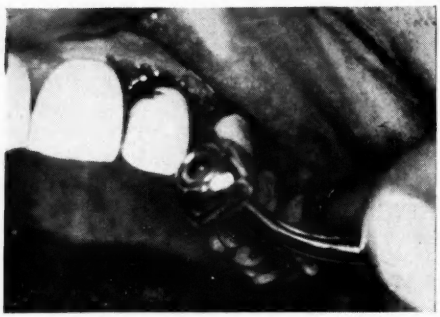

Fig. 2.—Elimination of an infrabony pocket by the gingivectomy technique (showing vertical incision by a No. 11 blade in a Blake's knife).

through the mucous membrane, without the necessity of raising a flap (Fox, 1955).

Typical sites for a combined gingivectomy and osteo-ectomy include buccal and lingual pockets, mesial and distal pockets adjacent to edentulous areas, and pockets associated with bifurcation and trifurcation involvements (Carranza and Carranza, 1956). Shallow "saucerized" pockets, which have become infrabony due to failure of buccal and lingual plates to resorb, can best be eliminated by removing the buccal wall and bevelling the bone, leaving the lingual plate untouched.

Conservative Methods (Closed).—

Deep Curettage.—Many variations of this method have been described. It is usually used to obtain re-attachment in the infrabony portion of the pocket, whilst the suprabony part is treated by gingivectomy, unless there is some contra-indication to the removal of soft tissues.

The prognosis is good in narrow pockets of less than 6 mm. depth (Beube, 1953), especially where the buccal and lingual bony plates are intact.

Gingivectomy Technique.—This is essentially a modification of deep curettage, and is described by Glickman (1958) as the "method of choice". The outline of the base of the pocket is marked on the gingiva, and the suprabony soft tissues are eliminated by gingivectomy. A No. 11 scalpel blade is then carried vertically through the tissues just deep to the epithelial lining of the remaining part of the pocket (*Fig.* 2). In this way the epithelium is freed from the underlying tissues, and is then gently curetted out, along with the superficial granulation tissue. The underlying bone is avoided during the curettage of the deeper granulations. Infected cementum is next removed, and the area is protected by a surgical pack.

Conservative Methods (Open).—

Flap Operation.—In more complex pockets the basic surgical principles of adequate access and control demand the raising of a gingival flap. A modification of the original Robicsek operation was well described by Goldman (1953).

Special pre-operative procedures include removal of abnormal stresses from the teeth involved and preparations for temporary splinting if this is to be used. Scaling and deep curettage of the pocket is carried out 3–6 weeks pre-operatively to reduce inflammation and infection (Beube, 1953).

Flap construction follows accepted surgical principles concerning blood-supply; incising through and over healthy tissues; and inclusion of the gingival margin if approached more closely than 4 mm.

A single vertical incision through the mucoperiosteum normally gives adequate access. This is made at the centre-point of the tooth mesial to the pocket, thus enabling distal reflection of the flap to give unobstructed vision. The incision extends from a point just short of the reflection of the mucobuccal fold to the gingival margin, and is then continued distally as a shallow incision along the gingival crevice in order to free the mucosa from the strong gingival fibres of the periodontal membrane (*Fig.* 3). The interdental space is best crossed on its palatal aspect. The incision usually ends at the

midpoint of the tooth distal to the pocket. Periosteal elevation produces a triangular flap, and, if additional palatal access is needed, equivalent incisions may be made, and a similar flap raised on that side. A flap of this type heals well.

More extensive access can easily be obtained by continuing the incision in the gingival crevice to embrace as many teeth as required, terminating in a distal vertical incision (*Fig.* 4).

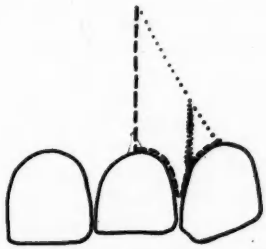

Fig. 3.—Flap construction. Single vertical incision.

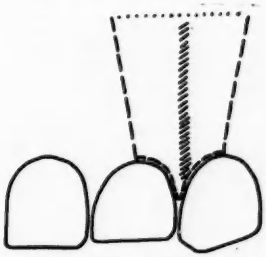

Fig. 4.—Flap construction. Double vertical incision.

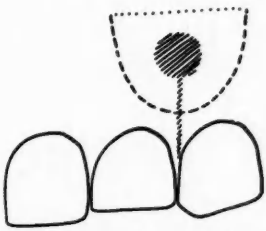

Fig. 5.—Flap construction. "Sorrin semilunar" incision.

Fig. 6.—Flap construction. "Miller button-hole" incision.

Fig. 7.—Flap construction. Kirkland "modified flap" incision.

Fig. 8.—Infrabony pocket, showing granulation tissue in situ.

An alternative approach is via a narrow, sharply curved "Sorrin semilunar" incision (*Fig.* 5), centred over the pocket, with its convexity towards the gingival margin. This incision is useful in "flask-shaped" lesions, where the main body of the pocket may be treated under direct vision, and the narrow neck curetted via the orifice.

The "Miller button-hole" approach (*Fig.* 6) is via a vertical incision directly over the apical part of the pocket, but access is poor

and the incision has the theoretical disadvantage of lying directly over diseased tissue.

Kirkland (1931) used a "modified flap operation". His approach was via a mesiodistal incision down to the bone along the gingival crevices on the buccal surfaces of the teeth adjacent to the pocket, and continuous across the affected interdental papilla (*Fig.* 7). Blunt dissection of the mucoperiosteum away from the bone allowed a limited access.

Fig. 9.—Removal of the epithelial lining of the pocket, by scraping the inner surface of the flap with a scalpel.

Fig. 10.—Bony defect made good by using anorganic bone chips.

Pathological tissues to be removed include granulations, epithelial lining, and infected cementum. The granulation tissue (*Fig.* 8) is removed first, by gentle curettage, to eliminate a fertile source of hæmorrhage.

Next, the epithelial lining is thoroughly removed so that it cannot act as an obstruction to horizontal ingrowth into the clot during organization. Removal by curettage is easy where underlying bone gives solid support, but if the buccal or lingual plate has been lost the pocket epithelium then lines the deep surface of the gingival mucosa and removal is more difficult. Cross (1957) advocated curettage of the epithelium prior to raising the flap. If the flap has been raised, it is held under gentle tension, and the epithelium removed by lightly scraping it with a scalpel (*Fig.* 9). Finally, a narrow strip is trimmed from the gingival margin of the flap to produce a good bevel and to ensure that the regenerative downgrowth of the epithelium is handicapped.

Beube (1953) advocates removal of all cementum in the area on the grounds that the underlying dentine acts as a better organizer of cementoblasts.

Bone grafting (*Fig.* 10) may be carried out at this stage, if indicated. It is probably helpful in cases where the orifice of the pocket is wider than 3 mm. at the alveolar margin (Cross, 1955).

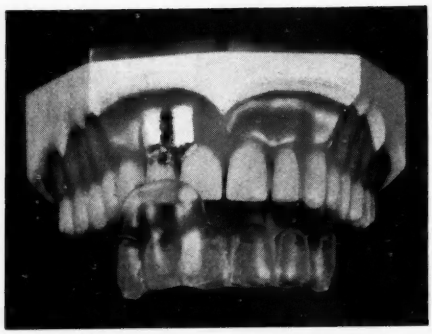

Fig. 11.—Acrylic cap-splint with extension flange to protect the dressing over the line of incision.

Surgical dressing and immobilization involve accurate closure of the flap, both for æsthetic reasons and to prevent bacterial ingress. Mattress sutures probably assist in establishing a good seal.

A waterproof dressing, such as adhesive tin foil, is then trimmed to shape, taken through the interdental space, and accurately adapted to seal the incision. It has been found that thin waterproof "Elastoplast" is also quite

effective; thorough drying and gentle use of warm air assist adhesion. Additional mechanical protection in the form of a surgical pack is usually necessary.

Splinting to provide adequate rest during the healing phase is desirable. Dental wiring is reasonably adequate, but an acrylic cap-splint is preferable, as this may incorporate an extension flange to protect the waterproof dressing (*Fig.* 11). The acrylic splint has to be removed temporarily when the sutures are being taken out and the initial cementing, therefore, should not include the teeth associated with the pocket.

If an acrylic splint is used, it should be trimmed back after removal of sutures to provide easy access for cleansing the field of operation. The splint is then firmly re-cemented and retained for a minimum period of six weeks.

The operation may be covered by systemic penicillin, especially if bone-grafts have been used (Cross, 1957).

Gentle cleansing of the area should begin immediately after removal of the sutures and gradually builds up to normal, including the use of wood sticks, over a period of two weeks.

The pocket should receive minimum investigation for a period of at least six weeks post-operatively (Cross, 1957).

Acknowledgements.—I would like to record my thanks to Mr. A. B. Wade, of the Royal Dental Hospital of London, for his guidance and aid in the preparation of this paper, and to Mr. Shilland, of the Photographic Department of the Royal Dental Hospital of London, for his assistance with the illustrations.

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Operative Treatment of Temporomandibular Ankylosis

The operative treatment of temporomandibular ankylosis presents several well-recognized problems. The newly formed joint is a ginglymus (hinge type) and cannot achieve the complex movements of the natural articulation. The normal healing of bone must be modified to ensure liberty of movement. The disfigurement of subnormal growth should be corrected at the same time.

The author has concluded that the centre of rotation of the mandible is at the posterior edge of the superior $\frac{1}{3}$ of the vertical ramus, and he makes the new joint in this region. He favours an approach from behind the angle. The bone is separated. A shallow cup is cut in the upper fragment. The lower portion articulates in this "fossa", contact between the two fragments is reduced. Bone is removed and bleeding arrested to suppress callus formation. A previously prepared sterilized small hood of soft plastic, 2 mm. thick, is threaded on to the new condyle to complete the isolation of the cut surfaces from each other.

The distorted appearance caused by unilateral failure of growth of the condylar cartilage often associated with ankylosis can be partially resolved using a plastic hood 5–6 mm. in thickness. Forward displacement of the shorter side of the mandible reduces the disability.

Post-operatively, the patient is kept on a liquid diet for 3 days only. Mastication is then begun. By 7 days chewing of tough foods has been encouraged. Normal use is reinforced by exercises.

This method has been applied to 42 cases since 1955, in an age range of 12–32 years. All but 5 had had unsuccessful previous operative interference. Thirty-two patients showed immediate opening of 2–2·5 cm. Ten improved more slowly. There have been no relapses in 28 patients still available for observation.—ROUDKO, V. (1960), *Dent. Fr.*, **20**, 33.

BOOK REVIEWS

DENTAL AUXILIARY PERSONNEL*

IT is not many years since it was a sign of good breeding (presumably post-natal) for a professional man to declaim all interest in his business affairs. Auditors responsible for his tax returns would fully support his ignorance as they attempted to file order from disorder. Efficiency in practice would at once bring to mind a moving-belt system—all highly unprofessional.

Suddenly, unmentionable bureaucracy demanded—and insisted on obtaining—form-filling of much detail and, usually in several difficult lessons, did a really worthwhile job in teaching the profession a degree of method in administration which could never have been acquired voluntarily.

This new knowledge of administrative management can provide a sound basis for a most worthy and professional study of increasing efficiency—first to enable more time to be spent at the chairside, and less at the desk, then to increase the productivity of the time spent at the chairside so that more good can be done to humanity! As increased experience brings increased efficiency, it follows that the attainment of such a goal should raise the standard of the work performed, and enable some hours each week to be saved.

Being still to some extent masters of our own destiny, it is a matter of personal choice whether these hours be spent in needful fresh air and exercise, in rest, or, for the more rugged, in ambitiously enlarging the practice. The last choice would deservedly carry with it the extension also of the personal bank account and annual contribution to our mutual partner, the tax gatherer, if not to our life expectancy.

If only, for the last ten years, we could have had an active Council on Practice Efficiency —such thoughts lead one to study the latest publication from the American Academy of Dental Practice Administration.

Occupying less volume than 2×20 cigarettes, and without illustrations, a first comment may be that this little book seems unduly expensive. However, it will be read by few who do not consider it worth many times its cost in their own practices, and the "meat" is as much as will be found in many larger volumes.

Here is an example of American virility in dealing with a problem which is as acute in Britain at the present time. By 1965 a population of 193 million is expected to require dental service. It is considered, wisely, that the only hope of supplying this service is through better use of surgery assistants, and by planning ahead now. So the Academy of Dental Practice Administration collected over a hundred practitioners and consultants in a two-day "Workshop" in Chicago in January, 1958, to explore ways and means. This book gives the gist of the deliberations and recommendations of the four Study Groups who assessed the potential under the headings of Obtaining, Training, Retaining, and Maintaining Dental Auxiliary Personnel. The following notes follow these headings.

1. Obtaining . . .: The various sources (Dental Supply Houses good, private agencies not so good save for speed, professional journals seldom read by assistants, etc.); how to state requirements; the value of the personal interview and what qualities to seek; the value of the mature woman, are examples of the material of this section.

The U.S. approach is different from ours, where perhaps more accent would be placed on interest, mental alertness, part-time potentials of the mature woman, sources of supply from the nursing profession, and perhaps more leaning towards personal training than in a

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* *Dental Auxiliary Personnel.* The Proceedings of a Two-day Workshop conducted by the American Academy of Dental Practice Administration, Chicago, Illinois. Edited by ROBERT K. STINAFF, D.D.S. 8½×5½ in. Pp. 157. 1959. St. Louis: The C. V. Mosby Co. (London: Henry Kimpton). 29s.

country where so many establishments conduct pre-training courses for dental assistants (twenty-one are listed in addition to the teaching schools).

2. Training . . .: ". . . with the increased demands, physically and mentally, on dentists to-day, your survival, actually, will depend on how well you develop and utilize potentialities of your work force". The value of secretarial training, and of compartmenting duties for training in such a progressive way that personnel can gradually assume the duties of others unavoidably absent, without dislocation of the practice, are useful items.

It is pointed out that dentists often do not know how to use auxiliary personnel because of inadequate undergraduate training.

3. Retaining . . .: A sample survey showed that numbers of responsible staff of long experience are often valued financially at a lower rate per hour than many cleaning women—a reflection which in Britain, too, explains why better quality helpers are often difficult to find.

The Committee emphasizes that true efficiency and better dentistry demand the use of *multiple* personnel.

Good service should be suitably rewarded, and incentives and fringe benefits should compete with those customarily available in commerce.

4. Maintaining . . .: It is interesting to note that in the U.S. there exists a "dental consulting service" by which practitioners can call in the dental equivalent of the industrial "Organization and Method" expert to advise on ways in which the efficiency of his particular practice can be increased. This section deals with the value of staff conferences and team work to improve general efficiency, and touches on some of the points of lay-out, personnel, organization, and method which seemed to the Committee to merit special mention.

By noting references which may be of future value to him the British reader can choose from the fund of information and add his own notes where his views differ, to compile a most useful personnel notebook.

I gleaned many helpful tips, and the recent graduate who is a prospective employee will find it an invaluable reference.

The organization behind this production provokes serious thought. First, admiration for such practical forward planning, then realization that at the present rate of 1·6 per cent increase the population will rise from 193 million to 350 million 35 years later and effective planning must be continuous and aimed at a constantly receding target at least *ten* years ahead.

Finally, complete dejection, as one re-reads the pertinent Editorial in this JOURNAL (January, 1960) showing our own failure to provide for the dental care of our children, and realizes the lack in Britain of any effective forward planning within our profession towards the large increase of capacity we know to be vital if we are to survive intact.

Unless inaction is quickly replaced in Britain by some long-term constructive initiative, of which this is but a sample from the U.S., then dilution must inevitably be thrust on us and it will be scant solace to realize that we fully deserve it.

Some "constructive ammunition" can be found in these pages to help also in fighting the braking effect of the newly proposed time-charging system—which would operate directly against the increased capacity so vitally needed.

S. L. DRUMMOND-JACKSON

FLUORIDATION. Errors and Omissions in Experimental Trials. By PHILIP R. N. SUTTON, D.D.Sc. (Melb.), L.D.S. (Vic.), Senior Research Fellow, Department of Oral Medicine and Surgery, Dental School, University of Melbourne. $8\frac{1}{2} \times 5\frac{1}{2}$ in. Pp. 83+x, with 7 line illustrations. Paper covers. 1959. Australia: Melbourne University Press. (London and New York: Cambridge University Press.) 8s. 6d.

BY a masterly marshalling of facts, and a rigid discipline of critical analysis, the author has condensed into this small book of 71 pages a most devastating and detailed criticism of the four major American fluoridation schemes, viz., those at Grand Rapids,

Evanston, Brantford, and Newburgh. The criticisms are not of fluoridation *per se*, but of the claims made for fluoridation from the results of these investigations. Like all vigorous counsels for the prosecution, the author has remorselessly hit out at the slightest error, omission, or misstatement appearing in the various reports.

No allowance has been made for the tremendous difficulties and tribulations which beset all field studies, particularly those of great magnitude and those destined to last for 10 years.

Nevertheless, the major criticisms are very real, and the author has brilliantly succeeded in establishing his case that the evidence from these experimental surveys is disturbingly unsatisfactory.

This challenging dissertation must be read by all those interested in fluoridation, and particularly by those contemplating a fluoridation programme.

D. J.

DENTAL ROENTGENOLOGY. By LeRoy M. Ennis, D.D.S., F.D.S. R.C.S. (Eng.), Chairman of the Department of Roentgenology, and Professor of Roentgenology, The Thomas W. Evans Museum and Institute, School of Dentistry, University of Pennsylvania, etc., and Harrison M. Berry, D.D.S., M.Sc., Professor of Roentgenology, The Thomas W. Evans Museum and Institute, School of Dentistry, University of Pennsylvania, etc. Fifth edition. $9\frac{3}{8} \times 6$ in. Pp. 607, with 1282 illustrations. 1959. London: Henry Kimpton. £5 12s. 6d.

It is ten years since the last edition of this book was published and LeRoy M. Ennis has now been joined by Harrison M. Berry as co-author.

The major changes in the new edition are the introduction of chapters on radiation protection, the temporomandibular joint, and the chemistry of calcification, otherwise the arrangement of the material follows the general pattern of the previous editions. This arrangement is rather unusual and it has never been easy to find certain topics. Some of the changes which have been made aggravate this state of affairs. Indeed, a general air of muddle and lack of balance now pervades this book.

Of the new material, that on radiation protection is good, but the chapter on the temporomandibular joint is uncritical and a number of ideas presented in the "Chemistry of Calcification" are no longer accepted.

Among those parts of the book retained from the previous edition is a lengthy discussion of the ossifying periapical fibroma. While much space is devoted to this condition, other notable pathological processes are omitted, for example, the giant-cell reparative granuloma. Globulo-maxillary and primordial cysts are mentioned in a classification of cysts, but neither is discussed in the text and there are no radiographs of them among the illustrations.

The general style of the text is discursive and one finds some of the digressions, as in the chapters on the child and the edentulous patient, rather tedious. Some of the phraseology also lacks clarity.

A number of typographical errors have escaped the attention of the proof-reader, including "anastomosis" used in place of "metastasis" in this and the previous edition.

A great deal that is good is still to be found in this book and the illustrations are plentiful and clear, but it is with much regret that the reviewer has to report that this work, which was once one of the foremost on the subject, is now no longer in the front rank of dental literature.

G. R. S.

Also Received

PRÉCIS DE STOMATOLOGIE. By Michel Dechaume, Membre de l'Académie de Médecine, Professeur de Clinique Stomatologique à la Faculté de Médecine Stomatologiste des Hôspitaux de Paris. Third edition—revised and augmented. $7\frac{5}{8} \times 5\frac{1}{4}$ in. Pp. 957, with 279 illustrations. 1959. Paris: Masson et Cie. Paper covers—4600 fr.; Cloth covers—5600 fr.

ABSTRACTS FROM OTHER JOURNALS

Endodontic Management of Posterior Teeth

It is claimed by the author that the percentage of success following root-filling is as high for molar teeth as for single-rooted teeth, and that in his practice more than 50 per cent of cases are molar teeth. Various criteria, however, have to be satisfied before root-canal therapy is attempted, among which are: that the patient should have good resistance; that the periodontal tissues should be sound; that the tooth should be treatable (i.e., free from gross anatomical deformities which would prevent proper access being gained to the apex of each root); and that the patient be co-operative.

The two major conditions for success are given as (1) an aseptic technique and (2) a rigid measurement control. Asepsis is achieved by use of the rubber dam, care over sterilization of instruments and the field of operation, and finally by an effective seal to the root canals between visits.

In assessing the anatomy and length of the pulp chamber and canals both the usual periapical radiograph and also a bitewing radiograph are taken. The latter gives a more accurate picture of the pulp chamber and the entrances to the canals.

Silver points are recommended as the actual root filling, fixed in position with cement.

The following points are stressed to facilitate technique:—

1. The floor of the pulp chamber has a configuration which leads naturally into the pulp canals. Care is therefore taken not to disturb this with burs.

2. The orifice of each canal is first widened as a prelude to instrumentation to the apex. This is performed with a reamer-like instrument, which is well tapered and square in section.

3. Reaming is not carried beyond size No. 2, which is the biggest reamer with flexibility enough to negotiate curvature of all canals.

4. Reaming precedes the use of barbed broaches, otherwise jamming of the broach occurs. A slight disadvantage here is that the pulp tissue is broken up.

5. Emphasis for success is placed on instrumentation rather than on drugs.

6. The silver points are tried in before cementing, and a radiograph is taken to check that the apex of each canal is reached. A pair of long-beak forceps is used to grasp each point at the orifice of the canal. The point is then cut about 2 mm. longer than this and the excess is squashed flat with pliers. Thus a flange is produced which prevents the point being pushed too far into the canal and also gives a handle to the point for easy insertion during cementation.—AUERBACH, MORRIS B. (1959), *J. Amer. dent. Ass.*, **58**, 61.

Use of Hyaluronidase in Dental Anæsthesia

Hyaluronidase is an enzyme which has the property of increasing the permeability of tissues by a reversible action on the hyaluronic acid component of connective tissue ground substance. In the dried state it can be stored for long periods and is soluble in water, though in solution it deteriorates rapidly. It is inactivated by temperatures above 57° C. and is remarkably free from specific toxic effects, the therapeutic index being in the region of 200,000. It is found naturally in certain bacteria and in snake and insect venoms.

In general medicine hyaluronidase is used to assist the dispersion of injected fluids. Its action begins several minutes after administration and persists locally for up to forty-eight hours. Unlike the action of many other additives it is preferable to avoid blending the hyaluronidase with the total volume of injected liquid as the excessive dilution is prejudicial to its action.

This "spreading factor" may be used to improve the quality of dental injection anæsthesia. A double injection technique is suggested. After pre-operative cleansing, local anæsthetic solution without a vasoconstrictor and containing a carefully determined

quantity of hyaluronidase is injected. A second injection of the local anæsthetic normally employed by the operator is administered. Anæsthesia is virtually immediate and lasts about twenty minutes. Another injection of the second solution may be given while operating, if required. The role of the second injection is to fill up the vastly extended field of diffusion. Clinical studies indicated that a large volume single injection containing both hyaluronidase and adrenaline was less effective. All solutions should be warmed to 98° F. before use. Injection must not be made into infected areas.

The advantages of this method are increased depth of anæsthesia, elimination of resistance to the anæsthetic and of waiting time, immediate cessation of pain sensation, and great reduction of post-operative swelling and pain. —TOLMAN, J. (1959), *Rev. franç. Odontostomat.*, **6**, 1488.

Chromization of Steel

Corrosion and wear of metallic objects commences essentially from the surfaces exposed to chemical or mechanical stresses. It is interesting to consider the possibilities of treating metal so that the surface layer is rendered inoxidizable or is hardened according to the stresses anticipated. "Chromization" of steel presents a simple and economic solution to these problems.

The diffusion of chrome into the surface of steel results in the formation of a surface layer of rust-resistant ferrochrome, with little change of surface hardness in the case of mild steels or equally rust-resistant chrome carbides of exceptional hardness in the case of high carbon or case-hardened steels. The chrome-enriched surface stratum formed by thermal diffusion cannot be detached or split by mechanical or thermal shocks, and is constant in thickness and properties however complex the shape of the treated pieces.

The following technique was developed by the National Bureau for Aeronautical Study and Research (O.N.E.R.A.). It consists of heating the steel pieces with granulated chrome in the presence of small quantities of a fluoridated transporter gas, i.e., ammonium fluoride or chrome fluoride, in a protective atmosphere, usually ammonia. The temperature is raised to 900°←1100° C. for low carbon steels and 850°←950° C. for high carbon steels and the length of treatment is up to several hours.

Chrome in the nascent state and traces of hydrofluoric acid are released at the metal surface. The inward diffusion of the activated chrome results in the formation of a surface layer of ferrochrome or of chrome carbides from ten to three hundred microns thick. The physical properties of the core metal may be altered subsequently by heat treatment.

This method may be used for case-hardening steel burs; for preventing corrosion by water or nitric acid; for protecting steel from the action of high temperatures; and for reducing the wear of moving parts. It also presents a method of alloying in the powdered state.

Results of the comprehensive testing of physical properties are not yet available.—STEPANIAN, J. (1959), *Rev. franç. Odontostomat.*, **6**, 1495.

Further Studies on the Experimental Production of Periodontitis in Dogs

A report on a method of experimentally producing periodontitis in dogs, containing a review of similar work by other authorities.

A flap was reflected, buccally and lingually, from around the premolars and first molars on both sides of the mandible and a narrow sliver of bone between 1 and 2 mm. long was removed from the crest of the alveolar process, both lingually and buccally, using a surgical chisel and mallet. The bone margin was smoothed with a small bone bur before replacing and suturing the flaps.

The dogs were sacrificed at weekly intervals up to six weeks, and the final dog at nine weeks.

It was found that destruction of the supporting structures was slow during the first two weeks after surgery, very rapid from the third to the sixth week, and then very slow.

The critical period of the surgical procedure was considered to be the removal of the bone slivers.—COLLINGS, C. K., and REDDEN, D. R. (1959), *J. Periodont.*, **30**, 284.

CONTRASTING TREATMENT IN TWO BROTHERS

By **P. H. BURKE**, B.D.S., H.D.D., D.D.O.

CASE REPORTS

THESE reports give an account of the clinical histories of two brothers who, though possessing apparently similar malocclusions of the Angle's Class II, division 1 type, responded to treatment differently.

John.—

CLINICAL HISTORY.—Of the two brothers John and Roger, John was the elder by four years. He first attended for the treatment of prominent maxillary incisors in 1948, at the age of 7 years 5 months. The family history revealed that the mother had a marked Angle's Class II, division 1 malocclusion with the maxillary incisors excessively proclined over the lower lip. Her

Fig. 1.—John. Facial views at ages 7 yr. 5 mth. and 18 yr. 3 mth.

Given at the meeting held on December 14, 1959,

anterior overbite was complete and excessive. During the swallow there was a marked contraction of the lower lip beneath the upper incisors, and these lips were judged to be potentially competent. Otherwise the family history was negative. General health was essentially average.

On clinical examination John's physique was noted to be small (*Fig.* 5). His facial profile suggested some degree of postnormality and labial incompetence (*Fig.* 1). The lower lip rested beneath the incisal edge of the maxillary incisors and his lips were described as incompetent, though mildly so. A tracing from a lateral skull radiograph showed that he was skeletally postnormal (*Fig.* 4 A). The incisal relationship showed a marked maxillary overjet (11 mm.) and an incomplete anterior overbite. This suggested that although the swallowing mechanism was not examined there was an anterior tongue thrust with probably a compensatory lower lip contraction beneath the maxillary incisors. The arch relationship was typical of an Angle's Class II,

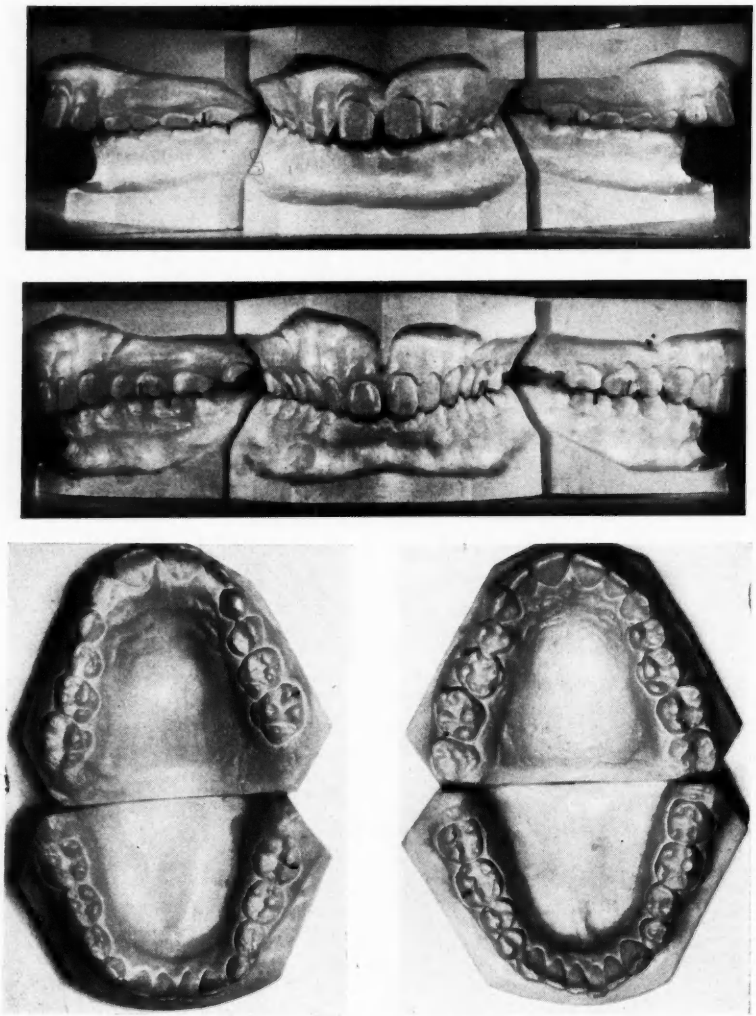

Fig. 2.—John. Study models at ages 7 yr. 5 mth. and 18 yr. 3 mth.

division 1 type of malocclusion; arch form was fairly narrow (*Fig.* 2).

There was no crowding with the exception of mild abio-version of the mandibular left central incisor. The dentition was in the mixed stage. Tooth quality, oral hygiene, and gingival health were satisfactory. In view of the family history the outlook for co-operation was anticipated to be good.

TREATMENT.—It was decided to attempt tooth movement in the mixed dentition, using an Andresen appliance. This was inserted at the age of 7 years 9 months. Shortly afterwards the boy fell, fracturing both maxillary central incisors, and orthodontic treatment was suspended for eight months. The broken teeth were protected with sedative dressings under stainless steel caps. When a further Andresen appliance was inserted at the age of 8 years 6 months it was activated, but no progress was made in the following year. This form of therapy was therefore abandoned in favour of a plan involving extraction of the maxillary first premolars and intermaxillary traction, using fixed appliances in the permanent dentition. John enjoyed a rest for about one year while

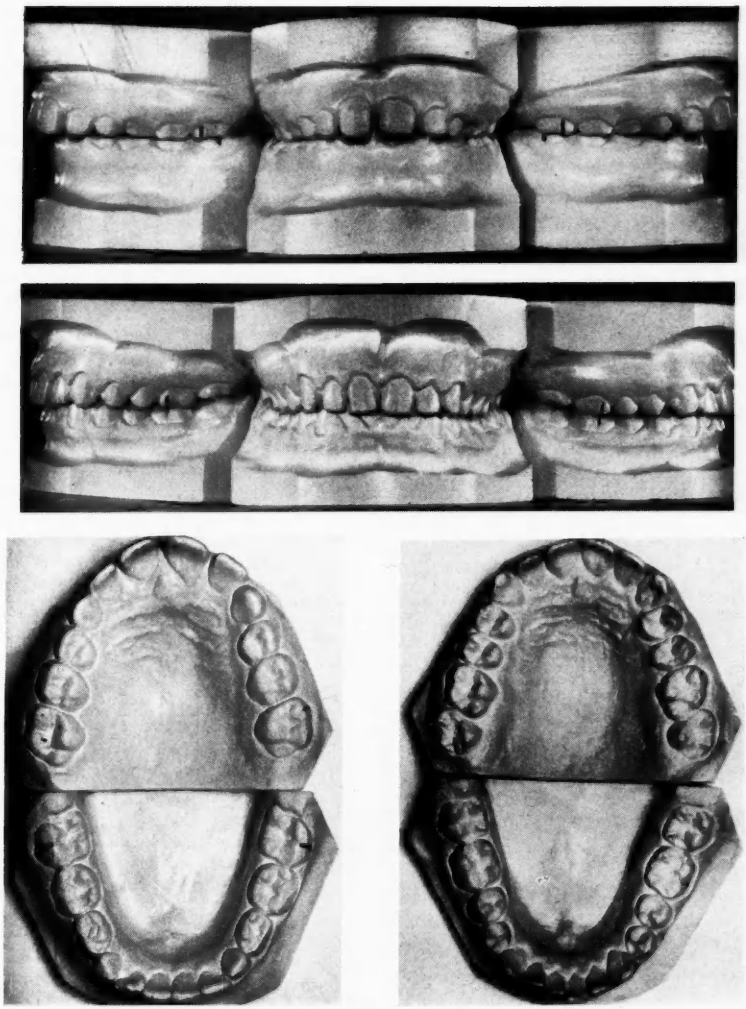

Fig. 3.—Roger. Study models at ages 8 yr. 4 mth. and 14 yr. 3 mth.

awaiting the eruption of the remaining permanent canine and premolar teeth. At the age of 10 years 3 months, after extraction of the maxillary first premolar teeth, fixed appliances were inserted to carry out intermaxillary traction. There was no reduction in the maxillary overjet after two months and so the upper fixed appliance was replaced by a further fixed appliance designed to apply intramaxillary force to retract the maxillary canines, using palatal springs originally designed by Rix (1938). This appliance had a long palatal arch to help anchorage. Three months later, when the maxillary canines were retracted, retaining spurs were added to the short palatal arch on the original upper appliance and intermaxillary traction was resumed. After wearing fixed appliances for a total period of nine months the maxillary overjet had been reduced to 4·5 mm.

The fixed appliances were replaced by a Hawley retainer with incisal guide plane. This was worn for eleven months and then discarded. The maxillary overjet subsequently began to increase, and in an effort to control the relapse the boy wore an oral screen for about one year. During this time the overjet increased until it stabilized at about 8 mm., but a part of this increase was due to the additional thickness of two acrylic caps which replaced the stainless steel caps on the central incisors.

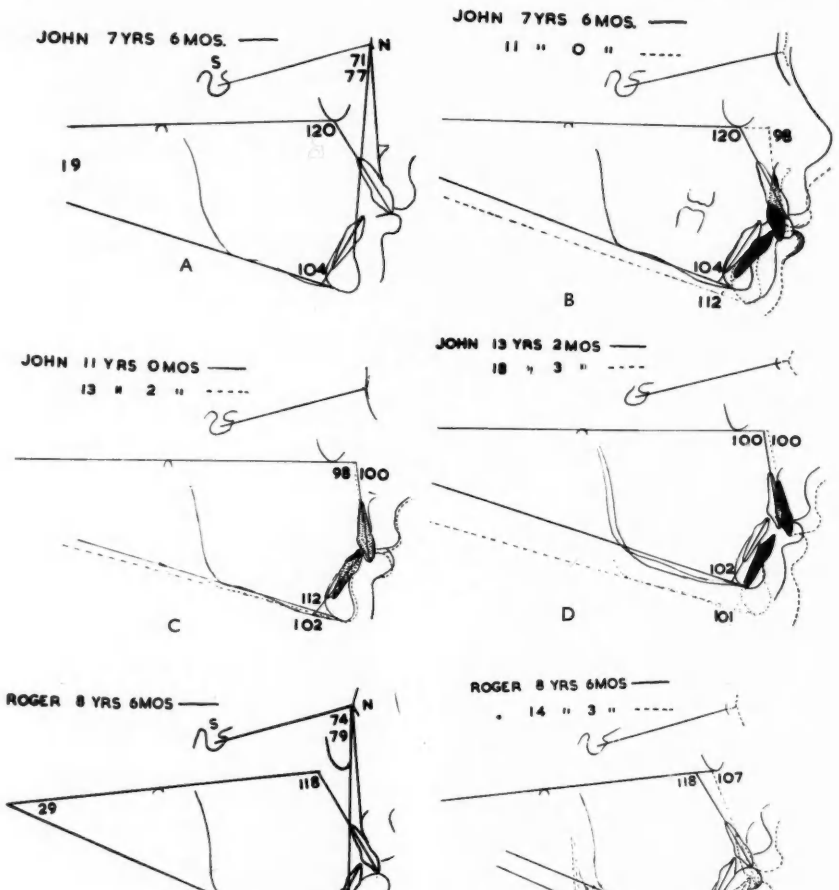

Fig. 4.—Tracings of lateral skull radiographs.

Active appliances were worn for twenty-one months, passive appliances for twenty-three months.

In the following five years of observation the overjet for the upper right central has diminished to 6 mm., mainly due to the replacement of the acrylic cap on this tooth by a porcelain jacket crown. The loss of tooth tissue on the left central incisor was deemed acceptable. The overjet on this tooth decreased to 3·5 mm., but this was related to increased labio-version of the lower left central incisor. The anterior overbite has remained stable. When the buccal occlusion is examined some recession of the gingivæ is noted on the mesio-buccal roots of both maxillary first permanent molars. The first premolar spaces have closed. There is also evidence of mesial tilting of the teeth in the upper buccal segments. The occlusal view of the study models shows the increase in imbrication of the mandibular incisors and in particular the labio-version of the left central incisor (*Fig.* 2). Radiographs taken in connexion with the porcelain jacket crown show no evidence of apical resorption of the maxillary incisors. The lips are now competent. The resting lower lip line is just above the incisal edges of the maxillary incisors (*Fig.* 1). His swallow is normal. The general configuration of the face has altered with growth and development. This boy's adolescent growth-spurt occurred relatively late (at about 15 years of age), but was vigorous. His present age is 18 years 3 months.

Roger.—

CLINICAL HISTORY.—Roger was four years younger than John. He presented, also for treatment of prominent maxillary incisors, at the age of 8 years and 4 months. His general health was good.

On examination he was found to be more advanced in his general growth (*Fig.* 5), and this was reflected in the growth of his jaws. The dental base relationship was postnormal though not so marked as his brother's (*Fig.* 4 E). The resting lower lip line was below the incisal edges of the maxillary incisors, the lips being definitely incompetent. During the swallow there was contraction of the lower lip beneath the maxillary incisors. No anterior tongue thrust was detected.

The incisal relationship was again one of marked maxillary overjet though not so severe as that of his brother, 9 mm. against 11 mm. The anterior overbite was complete and excessive. The arch relationship was typical of an Angle's Class II, division 1 malocclusion (*Fig.* 3). There was no crowding. The dentition was at the same stage as John's when he first presented for treatment. The main difference in arch form was a slightly greater intercanine dimension. Tooth quality, oral hygiene, and gingival health were satisfactory.

TREATMENT.—To test co-operation, which was suspected to be a possible reason for the failure of John's early treatment, Roger was given a removable bite plane which he wore well for six months, and which reduced the excessive anterior overbite. Co-operation being assured he was then given an Andresen appliance, at the age of 9 years, in an effort to correct the arch relationship. Six months later the biting position was brought forward and fifteen months after the insertion of the appliance the maxillary overjet had been reduced from 9 mm. to 4·5 mm. In a further six months the buccal occlusion had been corrected on the right side and was "cusp-to-cusp" on the left side. A new Andresen appliance was provided at this stage to guide the active eruption of the premolar teeth. Seven months later a final Andresen appliance was provided with a less protruded bite. This appliance carried boxed-in active spurs in 0·7 mm. stainless steel wire, bearing on the mesial aspects of the maxillary first permanent molars to complete their distal movement, particularly on the left side, which was lagging behind the right side. Appliances were completely discarded at the age of 12 years 2 months, the Andresen appliances having been worn three years two months. The occlusion was now normal, with the exception of a mild degree of disto-occlusion on the left side. The overjet was 4·5 mm.

In the subsequent two-year period of observation the occlusion has remained stable (*Fig.* 3). There is no deviation on closing related to the cheek-tooth occlusion on the left side. There is a mild degree of imbrication in the mandibular incisor area.

His lips are still incompetent, but he frequently hides this by voluntary compensatory contraction. At rest, however, the lower lip line is below the incisal edges of the maxillary incisors while the upper lip line is fairly high on the labial surface of the incisors. During the swallow, he achieves a firm lip seal over the incisors by a marked contraction of both upper and lower lips.

Roger's present age is 14 years 3 months.

TREATMENT ANALYSIS

John.—Analysis of John's treatment was carried out by superimposing tracings of lateral skull radiographs on S (sella turcica) and orientation on the SN (sella-nasion) line, i.e., the method used by Brodie (1941) (*Fig.* 4).

Stage 1: 7 *years* 6 *months*–11*years* (*Fig.* 4 B).–This stage included John's abortive treatment with the Andresen appliance and his intermaxillary traction. The increment of growth was large and the direction of growth of the face was downwards and forwards. Throughout the series the dental base relationship as measured by the angles SNA and SNB remained unchanged. In addition to the growth changes the maxillary incisors were retroclined some 22° and the mandibular incisors were proclined about 8°. The lower lip, with better support from the lower incisors, now made a seal with the upper lip over the labial surface of the upper incisors. This suggests that the lips may have been originally potentially competent.

Stage 2: 11 *years*–13 *years* 2 *months* (*Fig.* 4 C).—This was the stage of retention and partial relapse. The increment of growth was negligible. If one accepts Krogman and Sassouni's (1957) estimate of 3°–4° as the normal error to be expected when measuring tooth inclination, the maxillary incisors have retained their new inclination. The mandibular incisors, however, have relapsed to approximately their original inclination. This explains

the success of the Hawley retainer with the incisal guide plane and the lack of success of the oral screen as retainers. The relapse of the mandibular incisors has reduced support for the lower lip, whose posture has deteriorated slightly.

Stage 3: 13 *years* 2 *months*–18 *years* 3 *months* (*Fig.* 4 D).—This was the stage of observation only. The increment of growth is large since it

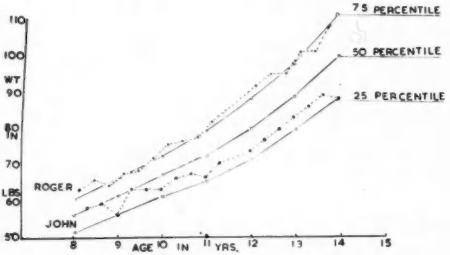

Fig. 5.—Serial growth records in weight.

includes the adolescent growth spurt. The inclination of upper and lower incisors has remained stable. The lip posture remains competent.

Roger.—

Stage 1: 8 *years* 6 *months*–14 *years* 3 *months* (*Fig.* 4 E).—This period includes Roger's active treatment and the two-year period of observation. The increment of facial growth was quite naturally large, but the direction of growth was more downwards and less forwards than his brother. The dental base relationship as measured by the angles SNA and SNB remained unaltered. In addition to the growth changes, the maxillary incisors have been retroclined about 11° and the mandibular incisors have been proclined some 5°. The lips are seen to be incompetent at both ages.

If growth of the jaws can be assessed by the anteroposterior dimensions available on lateral skull radiographs it is interesting to note that Roger's jaw growth at 8 years 6 months was equivalent to John's at 11 years, and again that his jaw growth at 14 years 3 months was equivalent to John's at 18 years 3 months.

COMMENT

This case report is not intended to support a plea for the indiscriminate use of Andresen appliances for the treatment of Angle's Class II, division 1 malocclusions in the mixed dentition. I do, however, wish to draw attention to a possible link between growth of the jaws and response to mixed dentitional treatment using the Andresen appliance.

Apart from the evidence of the differences in projected jaw size on the lateral skull radiographs, general growth records showed Roger's growth to be in advance of his brother's. According to Sutcliffe and Canham's (1950) growth tables for English children, Roger's serial weight records rested on or about the 75 percentile level whereas John's records fell consistently in the 25–50 percentile group (*Fig.* 5). The difference in height was less marked, but Roger was always ahead of John at corresponding ages and the difference gradually increased to nearly 2 in. at 14 years of age. Thus Roger lay just about the 75 percentile level for height and John just above the 50 percentile level. Shepherd, Scholl, and Vizoso (1952) have demonstrated the association between stature and jaw size.

It is, of course, only reasonable to expect that orthodontic tooth movement *en masse* will take place more easily when jaw growth is good and the size of the dental bases is greater. Comment has been made upon the absence of crowding as an indication for the use of the Andresen appliance by McCallin (1959). General growth records may be of help to clarify the indications for the use of this appliance.

In my opinion, factors favourable to successful mixed dentitional treatment using the Andresen appliance are:—

1. An Angle's Class II, division 1 arch relationship on a normal or mildly postnormal dental base relationship.
2. Lips which are potentially competent or mildly incompetent.
3. Good jaw growth.
4. Absence of proclined mandibular incisors.
5. Assured patient co-operation.
6. An operator who has been specifically trained in the manipulation of the Andresen appliance.

Acknowledgement.—I wish to thank the Photographic Department of the Newcastle upon Tyne Dental Hospital for its care in producing the illustrations.

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DISCUSSION

The President thanked Mr. Burke for his communication. Two case reports spread over a fair interval of time were something on which they had long wanted a report. Although Mr. Burke had shown a number of slides, two or three times as many could have been shown and it was astonishing how much material one could accumulate when one went into a case in detail. The communication could have been supported by many further intra-oral films and by cephalometric films, but that would have taken them beyond the limits of their time. He now invited discussion.

Mr. Breakspear said that he hesitated to criticize any case which someone else had seen because he knew that his own were very much open to criticism. They all knew how difficult that type of case was. He thought that he would probably have done the same as Mr. Burke. There were many cases in which one could not get a perfect result. The one point he wanted to make was that the insertion of the labial bow into the Andresen appliance seemed to be rather high and to make it difficult to trim the cusps in the most effective way. He could illustrate that with a drawing:

In the case shown, he noticed that the bow was inserted at A and that the wire then obstructed the trimming of the appliance. He instructed his technician always to insert it at B, about half-way between the upper and lower teeth and about one-third of the way back along the buccal surface of the upper first premolar. The appliance could then be trimmed as shown by the arrows.

Mr. Poulter thanked Mr. Burke for presenting two very interesting cases. Had he considered leaving treatment in both cases until very much later when the deciduous dentition had been entirely lost, instead of putting in an Andresen appliance at the mixed dentition stage?

Mr. Burke (to Mr. Poulter) replied that there was a great vogue in favour of treatment in permanent dentition at the moment. Some of the reasons for this were the difficulty of using intermaxillary traction in the mixed dentition and the need to retain the result until the canines had erupted. In his opinion, a very effective way of treating *suitable cases* of the Angle's Class II, division 1 type was the Andresen appliance in the mixed dentition. Otherwise, he agreed that they should wait for permanent dentition. One of the advantages of the Andresen appliance was that in the milder Angle's Class II, division 1 cases one did not need to extract in the upper arch. He had not extracted in the younger boy, although it might have reduced the strain on the mandibular anchorage if, for instance, the maxillary second molars had been extracted.

Mr. Tulley asked Mr. Burke how he trimmed the lower part of the Andresen in the cases shown. Did he keep the acrylic over the lower incisors and trim just occlusal over the lower molar region, to give them freedom to rise occlusally but hold them mesio-distally? He had found that this tended to help anchorage.

Mr. Burke (to Mr. Tulley) replied that if the incisal edges were not covered the incisors were going to erupt, which one did not want; therefore the incisal edges had to be covered to act as a stop. He did not expect to be able to guide the mandibular cheek teeth anteriorly. He cleared them for eruption but more or less vertically.

Miss Clinch thanked Mr. Burke for having shown the cases. She did not know whether it was the slightest help, but she thought that better results were obtained in the second case because Mr. Burke had not extracted. The younger boy had a postnormal occlusion of the mandibular arch and this arch relationship had been corrected, so that Mr. Burke had got very much better results than with the older brother, where the postnormal arch relationship had been ignored. The better results might also have been partly due to the fact that the younger child had a better potential growth pattern.

Mr. Burke (to Miss Clinch) said that he had been interested in the growth background and intended to probe into the growth records of the elder boy in the hope of illustrating that side.

Mr. Walther thanked Mr. Burke for an excellent communication. Was he not right in thinking that the first boy postured forward considerably? He had found that children who postured forward did not react to the Andresen appliance as well as others.

Mr. Burke (to Mr. Walther) replied that in 1948 the downwards and forwards habitual postural position was not known to him and he had not examined for it. If it had been present it would possibly have been a further explanation of the lack of response of the first patient to the Andresen appliance.

Mr. Tulley said that the occlusion in the intra-oral photographs appeared not nearly so abnormal as on the model.

Mr. Burke (to Mr. Tulley) replied that it was said that the camera never lied. The occlusion on the model was a full Class II, with no forward drift of mandibular buccal segments. Intra-orally there was a definite incomplete anterior overbite, and the magnitude of the overjet was 11 mm. That was as far as he could define it.

The President said that several things had happened since the case-history began. Nearly eleven years had

gone by. Eleven years ago they were all eleven years younger, including the children, and so was orthodontic knowledge, which had modified with time. They had had an interesting exercise in retrospection. He hoped that other cases would be chosen which would benefit members in a similar way.

Mr. Wilson said that he had fully trimmed Andresen appliances eleven years ago to control the eruption of the molars. Nowadays, he did so very seldom. Had Mr. Burke had the same experience?

Mr. Burke (to Mr. Wilson) said that indeed he had. He had found that the most valuable time for activation was during the time of active eruption of the premolar teeth. The Andresen appliance for the second boy was not trimmed until the deciduous teeth began to exfoliate. He felt that the action of the unactivated Andresen was due, possibly, to the mandible trying to get back to its rest position and thereby applying muscular force through the appliance to tilt the lower teeth anteriorly and the upper teeth posteriorly, in other words, a form of intermaxillary traction.

Mr. Mills said he felt that we were all apt to regard the question of extractions as one of principle rather than of expediency. In his opinion, the only reason for extracting teeth in any malocclusion was to correct the condition of crowding. He felt, however, that in many cases of Class II, division 1 malocclusion, crowding was in fact an important aetiological factor. He thought that in Mr. Burke's two cases the first boy had a potentially crowded mouth. In a case like this, distal movement of the upper cheek teeth was impossible since there was a continuous row of teeth right into the tuberosity. In the second boy, the jaws were longer and the Andresen appliance could move the teeth distally. Did Mr. Burke agree with this?

Mr. Burke agreed with what Mr. Mills had said.

The President said that they had two other communications, but he thought that the discussion had achieved their object, in that they had discussed two cases for which they had records, even though those records went back a long time and were not as complete as they might have wished. He had no doubt that if members looked back over their records for the last ten years, they would find interesting cases which could be discussed in a similar manner, particularly cases where there was some element of doubt or other important points for discussion. If such cases were brought forward, they would all learn the maximum from both their successes and their mistakes. He had great pleasure in thanking Mr. Burke for his communication. (*Applause.*)

Surgical Removal of a Denture impacted in the Œsophagus

The authors report the case of a woman, aged 58, who in July, 1958, during a coma resulting from a cerebrovascular accident, swallowed a large gold lower partial denture which replaced $\overline{65|567}$ (65 cm. × 3·1 cm.).

The patient recovered her powers of speech and movement. Persistent moderate dysphagia was attributed to residual bulbar paralysis. Examination of the pharynx was negative.

In October, 1958, the denture, thought to have been mislaid during the confusion of the previous July, was located radiographically in the patient's œsophagus, impacted at a level T3–T6.

Two attempts at removal through an œsophagoscope failed. In view of the dangers of mediastinal infection and ulceration into the great vessels of the thorax, the denture was pushed down to a level T8–T10. The lower third of the œsophagus was exposed by a left-sided transpleural thoracotomy. A 4 cm. incision into the œsophagus permitted digital removal.

Post-operative healing was complicated by bursting open of the thoracic wall sutures on the seventh day, pleural effusion, and the establishment of a pneumothorax. The œsophageal sutures did not fail. Recuperation was delayed by the patient's state of malnutrition and dehydration. X-ray of a barium swallow taken five months later showed normal œsophagus.

The authors submit that operative procedures and post-operative healing are more satisfactory if the incision into the œsophagus is well below the point of impaction of the foreign body, provided that it can be pushed down the œsophagus and cannot be removed by endoscopy. The left transthoracic approach, or gastrostomy where the impaction is subdiaphragmatic, is to be preferred.—CALVERT, HERAIL, LACOMME (1960), *Inform. dent.* (*Paris*), **42**, 168.

Lysozyme Content of Human Gingiva and Various Rat Tissues

Normal gingival tissue, kidney, spleen, and liver from 9 white rats were assayed for lysozyme content, as were 14 specimens of inflamed human tissue removed at gingivectomy.

It was found that normal rat gingiva contained an average of 11 times more lysozyme than inflamed human gingiva. Normal figures for the rat kidney, spleen, and liver, all of which were considerably less than the inflamed human gingiva, are given.—BURNETT, G. W., GOUGE, S., and TOYE, A. E. (1959), *J. Periodont.*, **30**, 148.